



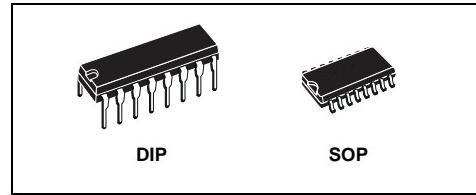
## HCF4009UB

### HEX BUFFER/CONVERTER (INVERTING)

- PROPAGATION DELAY TIME  $t_{PD} = 40\text{ns}$  (TYP.) at  $V_{DD} = 10\text{V}$   $C_L = 50\text{pF}$
- HIGH TO LOW LEVEL LOGIC CONVERSION
- MULTIPLEXER: 1 TO 6 OR 6 TO 1
- HIGH "SINK" AND "SOURCE" CURRENT CAPABILITY
- QUIESCENT CURRENT SPECIFIED UP TO 20V
- 5V, 10V AND 15V PARAMETRIC RATINGS
- INPUT LEAKAGE CURRENT  
 $I_I = 100\text{nA}$  (MAX) AT  $V_{DD} = 18\text{V}$   $T_A = 25^\circ\text{C}$
- 100% TESTED FOR QUIESCENT CURRENT
- MEETS ALL REQUIREMENTS OF JEDEC JESD13B " STANDARD SPECIFICATIONS FOR DESCRIPTION OF B SERIES CMOS DEVICES"

#### DESCRIPTION

The HCF4009UB is a monolithic integrated circuit fabricated in Metal Oxide Semiconductor technology available in DIP and SOP packages.



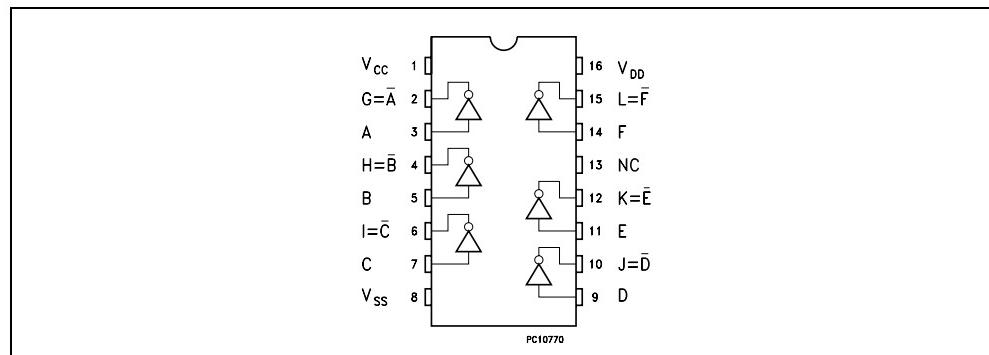
#### ORDER CODES

PACKAGE	TUBE	T & R
DIP	HCF4009UBEY	
SOP	HCF4009UBM1	HCF4009UM013TR

It is an inverting Hex Buffer/Converter and can be used as CMOS to TTL or DTL logic level converters as current "sink" or "source" drivers or as multiplexer (1 to 6).

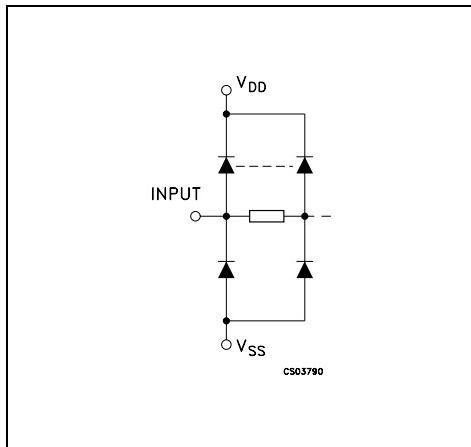
It is a preferred replacement of HCF4049UB in buffer applications.

#### PIN CONNECTION



## HCF4009UB

### INPUT EQUIVALENT CIRCUIT



### PIN DESCRIPTION

PIN No	SYMBOL	NAME AND FUNCTION
3, 5, 7, 9, 11, 14	A, B, C, D, E, F	Data Inputs
2, 4, 6, 10, 12, 15	G, H, I, J, K, L	Data Outputs
13	NC	Not Connected
1	$V_{CC}$	Positive Supply Voltage
8	$V_{SS}$	Negative Supply Voltage
16	$V_{DD}$	Positive Supply Voltage

### TRUTH TABLE

INPUTS	OUTPUTS
A, B, C, D, E, F	G, H, I, J, K, L
L	H
H	L

### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
$V_{DD}$	Supply Voltage	-0.5 to +22	V
$V_{CC}$	Supply Voltage	0.5 to $V_{DD} + 0.5$	V
$V_I$	DC Input Voltage	-0.5 to $V_{DD} + 0.5$	V
$I_I$	DC Input Current	$\pm 10$	mA
$P_D$	Power Dissipation per Package	200	mW
	Power Dissipation per Output Transistor	100	mW
$T_{op}$	Operating Temperature	-55 to +125	°C
$T_{stg}$	Storage Temperature	-65 to +150	°C

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied.

All voltage values are referred to  $V_{SS}$  pin voltage.

### RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
$V_{DD}$	Supply Voltage	3 to 20	V
$V_{CC}$	Supply Voltage	0 to $V_{DD}$	V
$V_I$	Input Voltage	0 to $V_{DD}$	V
$T_{op}$	Operating Temperature	-55 to 125	°C

This device has High to Low level voltage conversion capability only

## DC SPECIFICATION

Symbol	Parameter	Test Condition				Value						Unit	
		$V_I$ (V)	$V_O$ (V)	$ I_{OL} $ ( $\mu$ A)	$V_{DD}$ (V)	$T_A = 25^\circ C$			$-40 \text{ to } 85^\circ C$		$-55 \text{ to } 125^\circ C$		
						Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
$I_L$	Quiescent Current	0/5			5		0.02	1		30		30	$\mu A$
		0/10			10		0.02	2		60		60	
		0/15			15		0.02	4		120		120	
		0/20			20		0.04	20		600		600	
$V_{OH}$	High Level Output Voltage	0/5		<1	5	4.95			4.95		4.95		V
		0/10		<1	10	9.95			9.95		9.95		
		0/15		<1	15	14.95			14.95		14.95		
$V_{OL}$	Low Level Output Voltage	5/0		<1	5		0.05			0.05		0.05	V
		10/0		<1	10		0.05			0.05		0.05	
		15/0		<1	15		0.05			0.05		0.05	
$V_{IH}$	High Level Input Voltage	0.5/4.5	<1	5	4				4		4		V
		1/9	<1	10	8				8		8		
		1.5/13.5	<1	15	12.5				12.5		12.5		
$V_{IL}$	Low Level Input Voltage	4.5/0.5	<1	5			1			1		1	V
		9/1	<1	10			2			2		2	
		13.5/1.5	<1	15			2.5			2.5		2.5	
$I_{OH}$	Output Drive Current	0/5	2.5	<1	5	-0.8	-1.6		-0.65		-0.65		mA
		0/5	4.6	<1	5	-0.2	-0.4		-0.18		-0.18		
		0/10	9.5	<1	10	-0.45	-0.9		-0.38		-0.38		
		0/15	13.5	<1	15	-1.5	-3		-1.25		-1.25		
$I_{OL}$	Output Sink Current	0/5	0.4	<1	5	3	4		0.36		0.36		mA
		0/10	0.5	<1	10	8	10		6.4		6.4		
		0/15	1.5	<1	15	24	36		1.9		1.9		
$I_I$	Input Leakage Current	0/18	Any Input		18		$\pm 10^{-5}$	$\pm 0.1$		$\pm 1$		$\pm 1$	$\mu A$
$C_I$	Input Capacitance		Any Input				15	22.6					pF

The Noise Margin for both "1" and "0" level is: 1V min. with  $V_{DD}=5V$ , 2V min. with  $V_{DD}=10V$ , 2.5V min. with  $V_{DD}=15V$

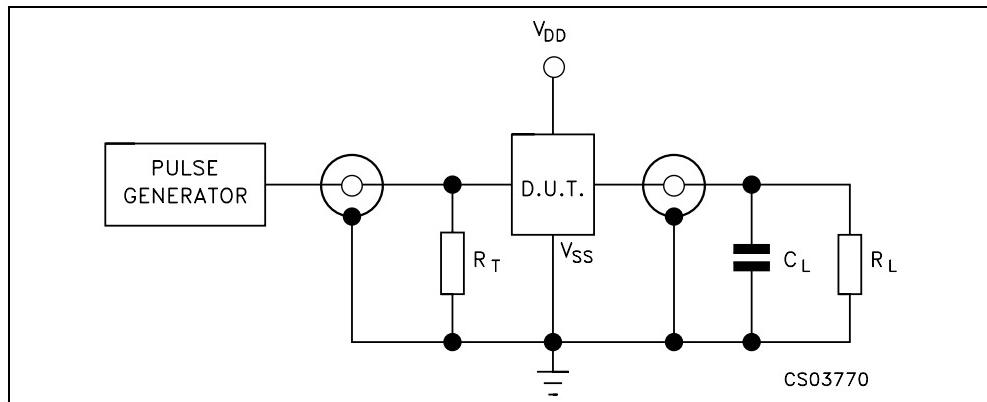
## HCF4009UB

**DYNAMIC ELECTRICAL CHARACTERISTICS** ( $T_{amb} = 25^\circ C$ ,  $C_L = 50pF$ ,  $R_L = 200K\Omega$ ,  $t_r = t_f = 20 ns$ )

Symbol	Parameter	Test Condition			Value (*)			Unit
		$V_{DD}$ (V)	$V_I$ (V)	$V_{CC}$ (V)	Min.	Typ.	Max.	
$t_{TLH}$	Output Transition Time	5	5	5		150	350	ns
		10	10	10		75	15	
		15	15	15		55	110	
$t_{THL}$	Output Transition Time	5	5	5		35	70	ns
		10	10	10		20	40	
		15	15	15		15	30	
$t_{PLH}$	Propagation Delay Time	5	5	5		70	140	ns
		10	10	10		40	80	
		10	10	5		35	70	
		15	15	15		30	60	
		15	15	5		30	600	
$t_{PHL}$	Propagation Delay Time	5	5	5		30	60	ns
		10	10	10		20	40	
		10	10	5		15	30	
		15	15	15		15	30	
		15	15	5		10	20	

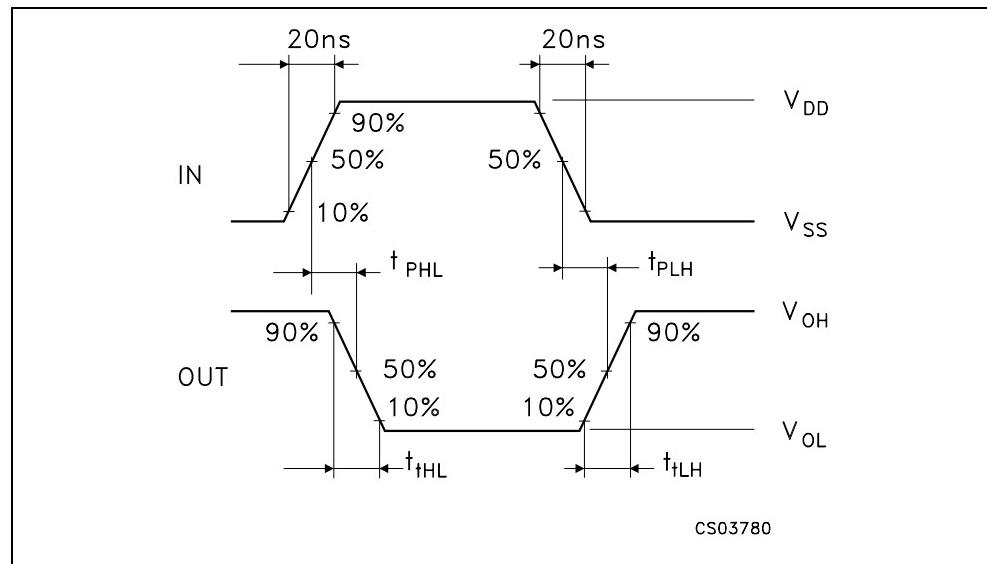
(\*) Typical temperature coefficient for all  $V_{DD}$  value is  $0.3\%/\text{ }^\circ\text{C}$ .

### TEST CIRCUIT



$C_L = 50pF$  or equivalent (includes jig and probe capacitance)  
 $R_L = 200K\Omega$   
 $R_T = Z_{OUT}$  of pulse generator (typically  $50\Omega$ )

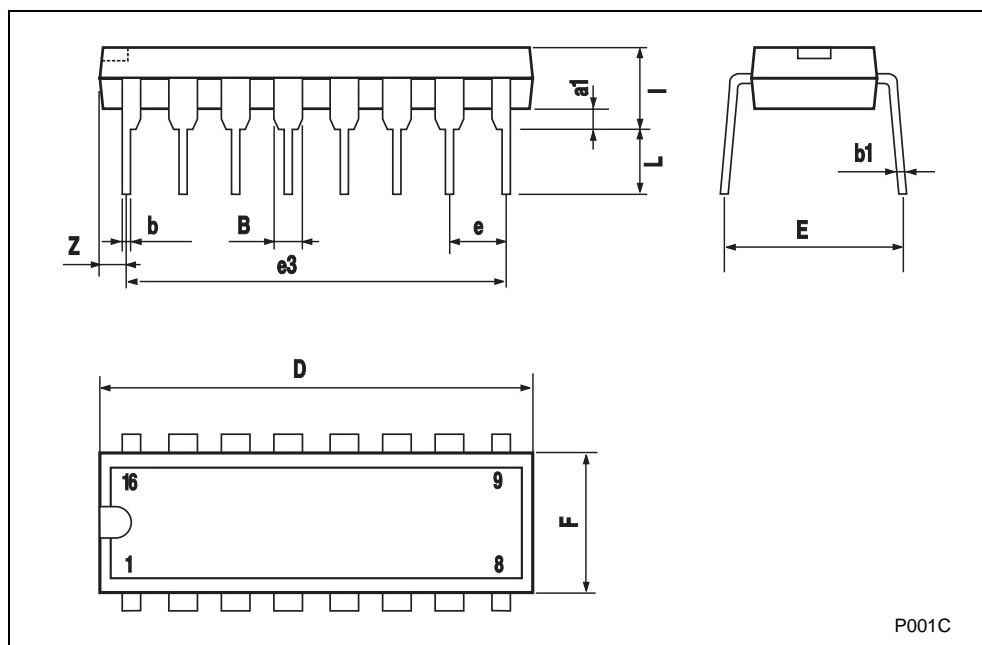
**WAVEFORM 1: PROPAGATION DELAY TIMES (f=1MHz; 50% duty cycle)**



CS03780

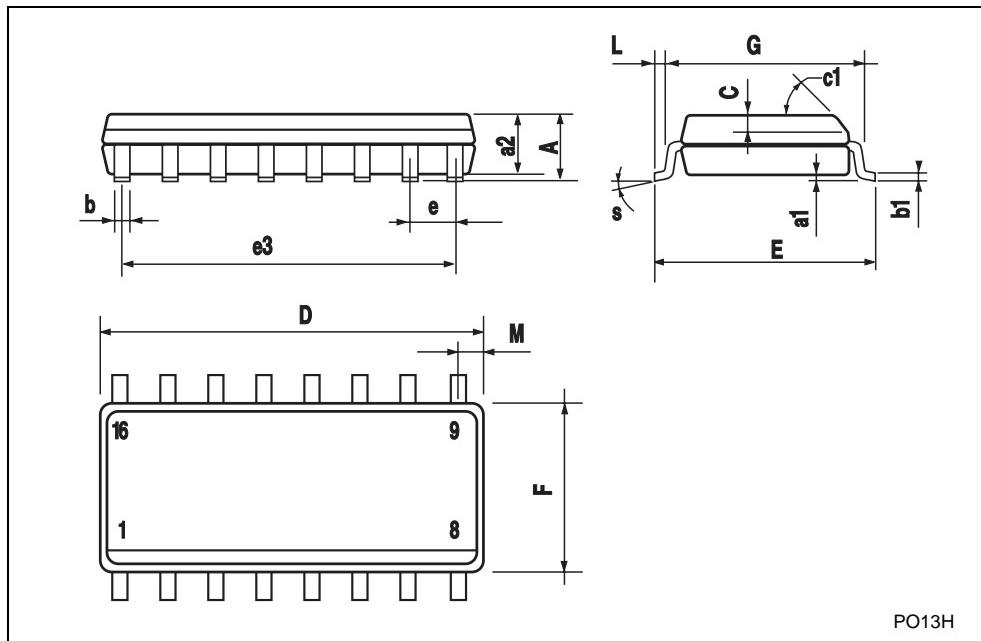
**HCF4009UB****Plastic DIP-16 (0.25) MECHANICAL DATA**

DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
a1	0.51			0.020		
B	0.77		1.65	0.030		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		17.78			0.700	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z			1.27			0.050



## SO-16 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.2	0.003		0.007
a2			1.65			0.064
b	0.35		0.46	0.013		0.018
b1	0.19		0.25	0.007		0.010
C		0.5			0.019	
c1		45° (typ.)				
D	9.8		10	0.385		0.393
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		8.89			0.350	
F	3.8		4.0	0.149		0.157
G	4.6		5.3	0.181		0.208
L	0.5		1.27	0.019		0.050
M			0.62			0.024
S		8° (max.)				



## **HCF4009UB**

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